Saskatchewan Agriculture

Economics Branch

Farm Management

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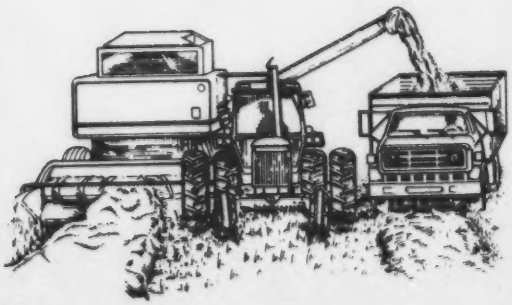

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GENERAL-USE SOFTWARE AND THE FARM

4m 86/08 ISBN 0-88656-377-1

89-06021/

General Use Software and the Farm

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Foreword

Microcomputers are a useful farm mangement aid, but only if there are programs available to run the computer. Over the years a large number of commercially prepared programs have been developed to meet most of the needs of farmers. However, in some cases an individual may have specific requirements. One option that should be considered in trying to meet these specific requirements is the use of what is referred to as "General Use Software".

General use software has been developed and refined over the past several years. It is software that has no predetermined use but does have a structured framework and processing ability. This software falls into three categories. These are: spreadsheets, data base management systems and word processing.

This publication will provide information on the three categories of general use software. The operation and features of each category will be outlined to provide a general understanding of how to use general use software.

This publication was prepared by Doyle Wiebe. The assistance of resource people and reviewers is gratefully acknowledged.

For further information or additional copies of this publication, contact your agricultural representative, regional farm management specialist or the Farm Management Section of Saskatchewan Agriculture, Room 329, Walter Scott Building, Regina, Saskatchewan S4S 0B1.

Farm Management Section
Economics Branch
Saskatchewan Agriculture
August 1986

A. General Use Software

i. How It Developed

Most microcomputers have ended up in homes or offices of small businesses with operators who have fairly complex requirements of the system. To meet these requirements, software must be either purchased or developed. To have a program written for individual requirement is quite expensive. While an individual's needs may be similar to many other users, they are often too different to be able to use someone else's program or some of the application software being marketed. (Application software are the programs which are written for specific applications, e.g. farm accounting, beef pedigree record keeping, etc.) If application software will meet your needs, it will be the easiest route to go. The criteria by which to decide on the various options in application software are discussed in the bulletin "Farm Computer Software - How to Evaluate Software for Your Own Use" published by Saskatchewan Agriculture 1986.

Shortly after the introduction of microcomputers, programming specialists realized the dilemma of many "would be" computer users as most users would not want to learn to program, but would be willing to learn how to use a framework and build an application on it. General use software makes building your own application easier than writing a program. However, more expertise is required than making use of someone else's program.

General use software developed and refined over the past few years has become widely used. These programs fall into three categories.

1. Spreadsheets
2. Data Base Management Systems
3. Word Processors

This bulletin will discuss these three categories of what is being called "General Use Software". (General ledger accounting programs apply to many situations as well, but are still considered application software due to their accounting application.) As these general use programs become more sophisticated, the distinction between the categories is becoming more difficult, as will be explained. However, an effort will be made to categorize the major programs available into one of the above three categories.

ii. Why Evaluate Their Potential?

Many first time computer buyers have had to rely on the opinion of someone experienced (to varying degrees) as to what can be done with a computer and the best way to accomplish the task. Every expert has a bias and if this bias does not correspond with the abilities of the new user, the result is not often a positive experience. The power of general use software has often been overstated by some (experts?) and yet other (experts?) have ignored the possible uses on the farm. This has caused many new users to either purchase application software that does not get the job done or to purchase a general use program that has the potential of meeting the needs only if the user has the time and ambition to learn how to build the application. The end result is often that the user becomes so disenchanted with the whole idea that the system just collects dust, or many of the potential benefits are never realized.

The decision on whether general use software is the way to go is a personal one. By learning more about the options available, a better decision can be made to help maximize the benefits from a computer system.

iii. What Are The Options?

There are basically four options a farm computer owner can look at to meet any one particular need. (These do not apply to word processing very well.)

1. Write the Program or Have It Written

Advantages: The user can decide exactly what the program is to do and limit it to those functions. You will know exactly how it operates as soon as its complete.

Disadvantages: To write your own program you must be prepared to learn a lot about how to program first, have the time to spend writing, testing, debugging, modifying and withstanding immense stress and frustration to complete. To have it written, cost is often very high and unless the programmer knows very much about your needs, often the end result is less than satisfactory and costly to change.

2. Purchase a General Use Program

Advantages: Cost is more reasonable, support services like short courses are often available and quite a bit of flexibility is available for many applications. You only have to buy one program for many applications.

Disadvantages: You must still know how to build the application (template) and then spend the time building it before any data can be processed. The resultant application will have limitations and will usually not be as easy to operate as a written program. Input errors are difficult to detect.

3. Acquire an Application of a Particular Spreadsheet or DBMS

Advantages: Only need to learn how to operate program. Therefore, less learning time required. With knowledge of the framework operation, you may be able to modify the application, without too much difficulty, to better meet your needs. Many spreadsheet applications (templates) are available for very low cost

from the public domain and some from the private industry.

Disadvantages: The application is limited to the constraints of the particular program. Some calculations may not fit your situation and may be difficult to change or remove. General use programs are not generally as user friendly as application software therefore learning how it operates may take more effort. Also, the general use software still must be purchased before a template can be run.

4. Acquire Application Software

Advantages: Usually application software is much easier to operate than general use software so time to learn before any results are achieved is reduced. The information reported is more often in a more useable form. The cost will usually be in line with how much information is processed.

Disadvantages: Reduced flexibility - You cannot change the program so you are limited, once a purchase is made, to the functions designed into it. On the other hand, to find a program that does what you want, you may end up with one that does much more than you need. (These may or may not be disadvantages because needs may change.)

This bulletin will deal with how to put in perspective the relative advantages and disadvantages of options 2 and 3 above. It is to be recognized here that there is no magic answer for everyone and even though you decide on one course of action, you are not limited to it. As you become more familiar with a computer system you may find more uses with the result being the implementation of any or all of the options outlined above.

B. General Use Software: A More Detailed Look

i. Spreadsheets

a. How They Work

Spreadsheets were conceived from situations where a column pad of paper was being used to write down numbers, make some calculations with them and later having to go back and change one or more numbers because either a calculation error or the need to make the same calculation using another set of numbers.

For example, you may have had to estimate income from crop production for the coming year and so you write down the acres on each field to seed, a yield estimate for the various crops and fields, and an estimated value per bushel. Multiplying the appropriate numbers and adding them together will give an estimated income. Somewhere along the way the expected price and/or yield changes from the estimate. To see the effect of these changes on income, many calculations would need to be repeated. A properly designed spreadsheet application would allow quick changes to only the numbers required and the resultant change to income would appear in seconds. Note: the important phrase here is "properly designed spreadsheet application".

When a spreadsheet program is first purchased, only a framework exists to build applications on. In the case of a spreadsheet, when the program is loaded into the computer, a partial frame actually appears on the screen. (See Figure I.) Along the top will usually be the letters A, B, C,. . .(some programs use numbers) which designate individual columns. Going down the side, numbers will appear designating rows. The computer screen only shows the top left hand corner of the spreadsheet. Most spreadsheets are much wider and much longer than what appears on screen.

VisiCalc, for example, which was the first spreadsheet, allowed up to 63 columns and 254 rows. At this point the spreadsheet is blank with all options open as to what the user can do with it. Just like buying a pad of paper with columns and rows, there is nothing there yet to indicate what kind of calculations will be desired. Thus the term "General Use Software" has been derived.

To make use of a spreadsheet, a template must be designed. Templates are not programs in themselves but rather are a set of instructions specifying that certain information will be entered in specific cells (cells are the boxes created by rows and columns intersecting) and that calculations will be done using formulas. These instructions change a blank spreadsheet into an active, useful worksheet. Once a template is designed, it can be saved as a file on a storage diskette for future reference.

As was mentioned earlier, one of the options to make use of spreadsheets may be to acquire templates from someone who has designed a template for a special purpose. To use them, however, knowledge of the operation of the spreadsheet program for which the template was designed must be gained first.

Templates designed for one spreadsheet program will not normally operate on another spreadsheet program. Therefore, if the template you are interested in is for VisiCalc then you must have the spreadsheet program VisiCalc and you must know how to operate it.

To get some appreciation for the different features the various spreadsheets have, the following will discuss the basics common to all spreadsheets.

Locations on a spreadsheet are referred to as cells. Usually a cell is nine characters wide (this width can be changed to suit the situation) made up of one column and one row. The brackets in Figure 1 indicate the location of cell A1. Knowing the location of a cell is important when building calculation formulas. Any

one cell can have one of three types of information in it.

1. Labels or Alpha Characters - words which can be used to describe the numbers beside or below.

2. Value - a number can be placed in a cell by itself identifying the cell as a value. By putting a number in a cell , it can be used in calculations in other cells.

3. Formulas (Calculations) - by the use of formulas the result of the calculation appears at that location. Formulas are made by referring to other cells and indicating what is to be done with the values in those cells. For example in Figure I cell A7 has been instructed to add up (sum) cells A3 to A6 inclusive. The resultant figure "1100" would appear in that location indicating the total of that column of numbers.

Figure I

```
     A        B        C        D        E        F
 1/(INCOME)
 2/
 3/ 250
 4/ 300
 5/ 150
 6/ 400
 7/SUM(A3. . .A6)
   1100
 8/
 9/
10/
```

In one sense, once you understand the above three options, the possibilities are almost endless. On the other hand, that would be like saying that once you know what a saw and hammer are for, here is a pile of lumber so go build anything you want. This analogy may not fit perfectly but in both cases, only a little thought would be required to build something simple. Whereas a lot more knowledge in the use of the tools would be necessary to accomplish a major task.

If your imagination has not yet come alive creating in your mind a number of potential uses of this tool, do not feel bad. The president of Apple Corp., one of the first and largest microcomputer companies, was the first to be approached by the inventor of VisiCalc, the first spreadsheet, with a demonstration in 1980. He did not see any potential in marketing it to the 100,000+ who eventually bought it within two years. It was one of the largest corporate blunders in recent time.

At this point, anything less than rewriting a complete spreadsheet program manual would not do justice to the potential of the spreadsheets on the market today. Since that is not the intent of this publication, the next section will simply outline the main spreadsheet programs available today and some of the features that should be considered when comparing the price versus value. For a more detailed list of characteristics to ask about see Appendix A.

b. Main Programs Available

The first spreadsheet and likely the most widely used computer program of all time is VisiCalc. Although still available for many makes and models, VisiCalc has taken a backseat in the last couple years to an onslaught of "bigger and better" spreadsheets. VisiCalc was designed for the 8-bit (first generation) microcomputers and made them about as powerful as possible given their limited memory space.

When IBM brought out their PC, which was the first in the next generation of hardware using 16-bit processors, taking the industry by storm, many improvements in software were possible. The memory size doubled and quadrupled again with faster processing speeds and access to large capacity storage mechanisms. Many programs have still not been written to take full advantage of these capacities, but many improvements were made in short order, particularly to the highest demand software, namely spreadsheets.

Supercalc and Multiplan were two of the first to come out as much improved spreadsheets over VisiCalc. Since spreadsheet size itself was not considered a limitation because it could not be filled with only 64K memory anyway, their main improvements were in the area of user-friendliness, i.e. the ease of a user to learn and to operate the program. Some improvements were also made in the mathematical functions allowed and the integration characteristics. These programs are still popular and available for many models of both generations of hardware.

The next major player on the scene was Lotus 1-2-3. Its numeric name is derived from its new integration of spreadsheet, data-base and graphics capabilities. More on integration later, but it is important to note here that Lotus 1-2-3 took a big step in setting a new standard for spreadsheets. It will likely be improved upon by others as well as newer versions of Lotus itself. It has become the fastest selling microcomputer program in the world.

A new player on the scene providing integrated software in all the three general use categories as well as graphics is the SMART Software System. It has improvements in many areas of user-friendliness and features and its price tag is also attractive. Some reports indicate that the Smart Software System is rivalling Lotus 1-2-3 in current sales, although it will take awhile to catch up on total sales.

The above five programs namely: VisiCalc, Supercalc, Multiplan, Lotus 1-2-3 and SMART are the most likely names you will run across in questioning computer dealers, extension personnel or reading about templates available. These are the ones most widely used because they run on the most popular makes and models of hardware. Other hardware makes and models may have their own spreadsheet program available as part of a package such as "Deskmate" or

"Appleworks". These may do the job for you just fine, particular if you are going to design all the templates you want to use.

There is one big concern, however, that you should put above all other features in selecting a spreadsheet program. There are still few makes and models of hardware where you can take a diskette from one and run it on another. Besides this problem, not all spreadsheet templates can be run by all spreadsheet programs. For example, even using the same hardware, Multiplan will not operate a template written with Supercalc. Several of the newer spreadsheets will allow conversion of VisiCalc templates, and some others, to run under their format but even then the calculations must be checked for accuracy. For example, Multiplan will do a fairly good job of converting VisiCalc templates. However, some differences will result possibly causing calculation errors.

This is also why new spreadsheet programs will have a tough time cracking the marketplace. A large number of institutions, government agencies and national businesses have invested both time and money into having staff learn and develop templates for their own use using a particular spreadsheet program. Learning a new system is a little like learning a new language. Therefore, unless there are major improvements, many will stay with what they know best as well as to stay compatible with others in the office, industry or agency.

Since you will likely want to acquire templates from private and/or public sources to save the work of designing them yourself, it is important to find out what conversions are possible and what programs are most widely used in the area. The three western provincial Departments of Agriculture each are primarily using different spreadsheets at this time. They are:

Provincial Agriculture Department	Spreadsheet Used
Saskatchewan	Multiplan
Alberta	VisiCalc and Lotus
Manitoba	Supercalc

Note: The Alberta Agriculture Department is the only one presently providing templates to farmers for a nominal fee.

c. Using Templates

Once a template is designed it can be saved on a diskette. The data on the template may be changed and the new template can be stored using a different file name. This way, for example, several complete cashflows, budgets, etc., can be stored for future reference, without having to enter all the data on each if only a few differences are necessary.

Each template will contain, as pointed out earlier, labels, numbers and formulas. One of the most common problems is accidently replacing formulas with numbers without realizing it. Depending on the spreadsheet, it may be difficult to see which cells are to be entered and which are calculated cells. For most spreadsheets, if the cursor is placed on a calculated cell, the formula for that cell's calculation will appear somewhere on the screen (either top or bottom). The locking of certain cells will partly solve this problem. However, cells can be unlocked or the locking feature overridden quite easily. Careful entering of data is recommended the first time through so you will be able to see exactly what calculations are being made by the template. To avoid serious problems, always have the original blank template saved on a separate diskette. This will not only ensure that you have an original copy with all the calculations on it, but will also act as a backup copy in case something happens to the diskette.

d. Features Important to Farm Applications

There are many functions all spreadsheets have in common. The differences will be primarily in two categories.

1. Functional - actual differences in capacity and capabilities. For example one allows more rows and columns than another.

2. Cosmetic - many of the so called cosmetic improvements are very important to improve a first time user's ability to operate the program. The cosmetics of a program (also called user-friendly characteristics) do not change what the program actually does. Rather, they help to communicate to the user both how to more easily perform those functions and also the information for which the template was designed. For example: being able to color different parts of the screen to highlight certain numbers is a definite cosmetic feature.

Some cosmetic differences among programs should have little bearing on a decision to purchase because they do not enhance or detract the program operation. They are simply style differences. It is, therefore, important to identify the cosmetic differences and determine which are important to you and those that are not.

Appendix A has a more complete list of characteristics which can be quite important in building and/or using spreadsheet templates. Both functional and cosmetic characteristics are listed. However, the list is not complete for two reasons. Firstly, many of the functions available in a spreadsheet program are never used by the average user or required by most farm applications. Secondly, new features come out almost as fast as they can be invented. There are so many different kinds of people using spreadsheets that someone is always coming up with some idea to solve some problem they have identified. Many features today were not even dreamed of by the spreadsheet programers only a few years ago.

The list in Appendix A should be used as a guide to learning about spreadsheets in general or as a checklist of characteristics to become familiar with after a purchase is made.

The short list of both functional and cosmetic features below provides an explanation of the relative importance of each for various applications. They have been chosen primarily because they are not common to all popular spreadsheet programs.

Assuming your primary purpose will be to develop your own templates, you must decide which ones are most important for the applications you are planning and how much they are worth to you, i.e. more expensive programs will generally have more of the following features but if you will not need them, there may be no need to pay for them.

Specific Features to Look For

1. Functional

Date Calculations

This function is primarily used to calculate the number of days between two dates. Since many spreadsheets now support a simple data base record keeping format (see next section on data bases), calculating the number of days between two dates can be very useful. For example, if livestock feeding records were being kept with weights at various dates, by automatically calculating the days between two weighings, the average daily gain could also be calculated.

Sorting Capabilities

As soon as a spreadsheet has sorting capabilities, it has a data base management component. As will be discussed in more detail in the next section, being able to look through data and sort them in an order for further analysis is an important part of data base management. Spreadsheets are limited, however, in the way data can be entered and displayed to make use of sorting.

Sorting by way of spreadsheets is done based on one column of data where each row has other data associated with it. A choice of ascending or descending order should be available and it should be known if sorting can be done by both Alpha and Numeric fields, i.e. either numbers or letters.

For example, if a row of data included the pedigree and growth performance for an animal in a beef herd, sorting the birth weights in descending order would immediately show the heaviest calves first on the list. A good data base manager, however, would allow sorting by birth weights and then selection criteria like 205 day adjusted weights between 400 and 500 pounds. The information reported would list the best animals for breeding.

Conversion of Other Program Templates

As was mentioned earlier, many useful templates have been designed to run on various spreadsheet programs. Even if the plan is to only write your own templates it would be good to know what templates are convertible or compatible with that particular program. As you gain knowledge of the general state of farm computing, you will likely become aware of templates available for many applications you had not thought of and could not take the time to design yourself.

Graphics Capabilities

Converting a series of numbers into graph forms can be very useful in understanding what the numbers mean. This may be built into the program as a format output option or it may be a program module which must be purchased separately. In both cases, check on the hardware requirements to show the graph on screen and/or on a printer.

Integrating Files

This refers to the ability to have certain data from one template (stored as a file on diskette) to be transferred automatically to another template without having to re-enter it. For example, the results from a production planner and budgeting template would be used again on a cashflow template. Most programs now allow this but they do it in different ways. Again a demonstration would be very useful.

Integrating Programs

As the hardware becomes more powerful and large storage mechanisms become more commonplace, integrating programs together becomes more possible. Certain calculations or data from a spreadsheet file may be very useful to a data base manager or word processor program. The ability to transfer that information in a useful form is important.

2. Cosmetic

Help Screens and Messages

With the much increased size of memory in the new generation hardware, many parts of a manual can be loaded into memory with the program. When problems arise during the operation, on screen explanations of possible solutions are built into some programs which can be accessed without terminating the work being done.

Messages and command prompts vary a great deal. Some are very abbreviated or ambiguous causing the operator to search through the manual or go to a help screen. Much time and frustration can be saved if the program has been well designed and if a demonstra-

tion is given on how to move from command to command.

Using Cursor to Build a Formula

To build a formula at one cell, locations of other cells are used. Errors can more easily occur if the locations to be used in the formula must be typed in. Some spreadsheets allow the cursor to be moved in a certain sequence to the locations which will be used in the formula.

Locking Cells

The ability to lock certain cells makes entering data much easier. If only the cells requiring raw data input are left unlocked, the user can move more quickly through the required input items and ensure that formulas will not be inadvertently replaced by numbers. This is one of the biggest potential problems when using spreadsheets. Options like locking only and all formulas are also useful and should be used. Check on what keys are used to move through the unlocked cells only.

Copy or Replicate

This is one feature that is common to most spreadsheets. It is mentioned here because of its high degree of usefulness. Make sure to see how copying of contents or formulas is done. It will speed up template building considerably.

Printing

Some spreadsheets will not know how wide or long the paper is to be printed on. If the spreadsheet to be printed is larger than the paper the user must be more careful to only print out the number of columns and rows possible. New features include being able to indicate how wide and long the paper is and the program will print out the information on several pages, if required. This feature makes printing of all necessary information much easier.

It is important to have a good demonstration of all features of the general use software program. Several times throughout the above discussion on features, the need to have a demonstration was stressed. Receiving a good demonstration may not always be easy. Look for learning guides in addition to the manual and ask about introductory and advanced short courses. An advanced course would be more useful once you become familiar with the program in your particular work environment and have tried to build or use templates. It is difficult to appreciate the more powerful features of the spreadsheet until some experience is gained.

e. A Typical Example Spreadsheet Template

Without ever seeing a few example applications of spreadsheets, it is difficult to imagine what they might be used for. A good example of a spreadsheet template in the financial management area is a cashflow forecast. Usually monthly cashflows are done to determine if and when an operating loan may be required or if cash will be available for personal items. For simplicity a quarterly cashflow is shown here in Figure 2.

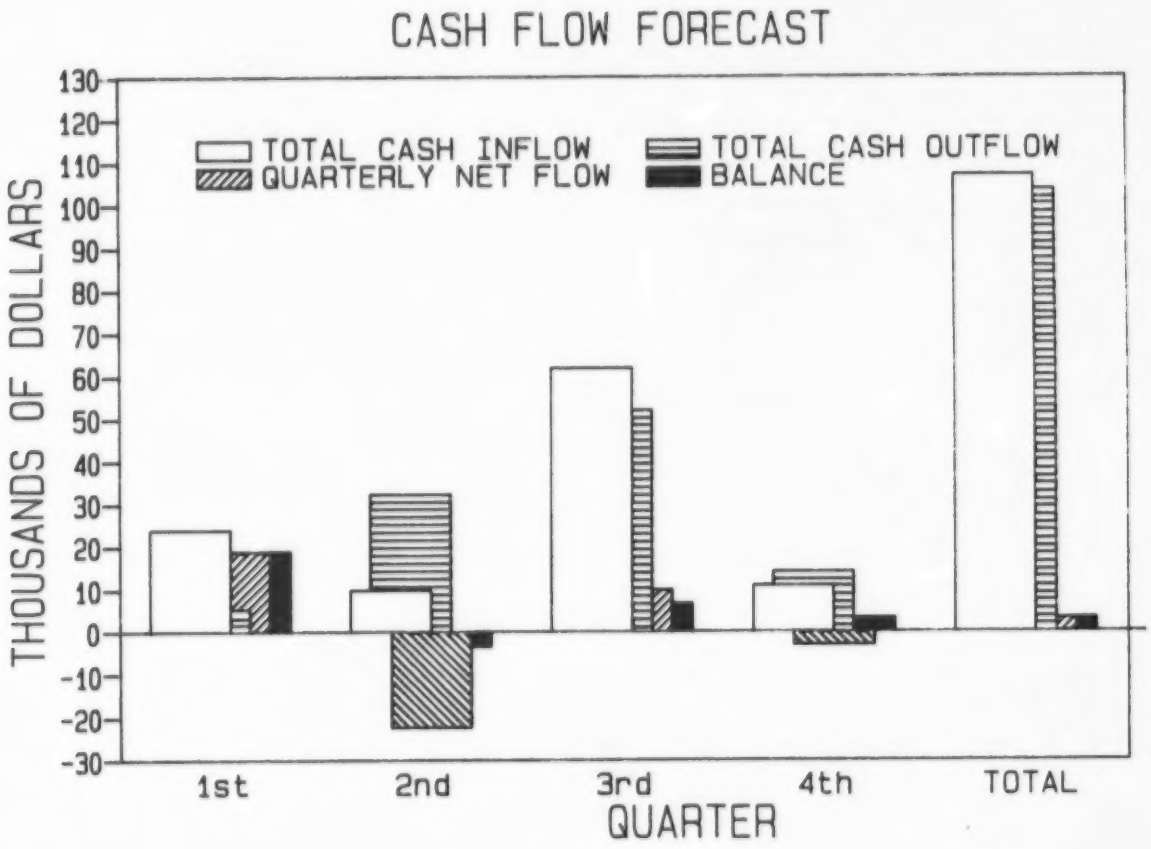
Figure 2
Spreadsheet Template: Cashflow Forecast

For: J. J. Farmer, 1986

Cash Flow Projection	First	Second	Third	Fourth	Total
Projected Cash Inflow					
Cash on hand	1,000				1,000
Crop sales: Wheat	15,000	10,000	7,000	8,000	40,000
Canola	4,000	0	15,000	0	19,000
					0
Livestock sales	0	0	10,000	2,000	12,000
					0
Livestock product sales	0	0	0	0	0
					0
Other farm income	4,000	0	0	1,000	5,000
Notes and accounts receivable	0	0	0	0	0
Other income	0	0	0	0	0
Term loan	0	0	10,000	0	10,000
Capital sales	0	0	20,000	0	20,000
Total cash inflow	24,000	10,000	62,000	11,000	107,000
Projected cash outflow Fuel, oil, grease	500	3,000	3,000	1,500	8,000
Equipment repair and upkeep	1,000	2,000	2,500	500	6,000
Equip. rental/custom charges	0	0	0	0	0
Shop supplies, tools, hardware	0	600	700	0	1,300
Crops: Seed purchases, cleaning, etc.	0	1,200	0	0	1,200
Fertilizer	0	4,000	0	2,500	6,500
Weed and insect sprays	0	5,000	0	1,000	6,000
Hail, crop insurance	0	500	2,500	0	3,000
Baling twine	0	500	0	0	500
Other	0	0	0	0	0
Livestock: Feed purchases	0	1,000	500	0	1,500
Salt, min., vitamins, vet., etc.	400	500	200	300	1,400
Livestock supplies	0	0	0	0	0
Pasture rentals	0	0	600	0	600
Breeding fees	0	0	0	0	0
Marketing charges	0	0	0	0	0
Purchase of feeder animals	0	4,000	0	0	4,000
Purchase of breeding stock	0	0	0	0	0
Miscellaneous: Hired labour	0	0	0	0	0
Property taxes	0	0	1,500	0	1,500
Building repair and maintenance	0	0	0	0	0
Miscellaneous	300	500	500	400	1,700
Accounts payable	0	0	0	0	0
Family living allowance	3,000	3,000	3,000	3,000	12,000
Income tax	0	1,500	0	0	1,500
Capital purchases	0	0	35,000	0	35,000
Debt payment (P & I)	0	5,000	2,000	5,000	12,000
Total cash outflow	5,200	32,300	52,000	14,200	103,700
Quarterly net flow	18,800	-22,300	10,000	-3,200	3,300
Cash balance to date	18,800	-3,500	6,500	3,300	

A sample of the graphic capability of a spreadsheet is shown in Figure 3. A bar graph of Inflow, Outflow, Net Quarterly Flow and Net Flow to Date is shown. This particular graph was produced by Lotus 1-2-3.

Figure 3
Spreadsheet Produced Graph:
Cashflow Forecast



f. Limitations of Spreadsheets

After reading through the above discussion of spreadsheet operation and types of applications, you may now be of the same opinion as some people that a good spreadsheet is all the software a farmer needs. There's no doubt that the full potential of spreadsheet application on farms has still not been realized, but there are some inherent limitations of spreadsheets that should be considered before discounting the value of application software.

The main limitation of spreadsheets is their lack of user-friendly characteristics. Until you see the difference between a spreadsheet and a menu-driven application software package, this limitation may not seem very important to you. Even after observing, this consideration may not be a problem. The main determining factor is how much time you want to spend learning how the spreadsheet works and how to interpret the information results from individual templates. For relatively simple applications, the spreadsheet is definitely the most practical. If all the inputs will fit onto a screen or two and the output can also be seen on one screen or one printed page, the advantage of seeing the results as soon as input is changed, is a real advantage. However, once more complex applications are required, such as farm accounting or pedigree records for several years of data, scanning through the template to get the necessary information in the format desired can become quite cumbersome.

The user-friendly disadvantages of spreadsheets are primarily in two forms.

Firstly, the lack of prompting ability, i.e., menus and input questions, to lead the operator through the program is an ongoing problem with most spreadsheets, although some are making some progress in this area.

Secondly, the ability to produce neatly designed reports that provides the information in an understandable form is limited.

Some people consider operating spreadsheets as half way between writing your own program and operating application software. This may not be at all fair to say for many users who have found spreadsheets very easy to use. The limitations will be completely relative to the amount of time you wish to spend with a system and the type of application required.

ii) Data Base Management Systems (DBMS)

a. What Are They?

One of the primary reasons for computers in large businesses today is due to their Data Base Management function. In short it is the ability to take a large amount of data which has common characteristics and organize it in a more useful way. To better understand this explanation, a simple example should help.

One of the simplest examples of a data base is an address book. The address book itself is the management system for the names, addresses and phone numbers which represent the base of data (Data Base) to be organized. If only a list was kept of names and addresses and it stretched into several pages, it would be difficult to locate any one name and address. An address book, which is in alphabetical order, simplifies the task of finding a specific name.

By putting the basic information (raw data) into a DBMS, the operator can later update the data base (i.e. add or delete an address) and have the information required sorted and printed out in the order desired. The information could not only be printed in alphabetical order, but could be sorted into groups such as a group for each province.

Referring back to our definition of general use software, the reason a data base manager falls into this definition is that when it is first purchased, the application (mailing list above) is not included. There is no predetermined use for the program. The same program could be used for a simple mailing list one day or a sow record keeper the next.

A true DBMS will be capable of doing much more than just reorganize data entered. If, for example, the birthdate for each person on a list was entered, some DBM systems will be able to calculate their present age. The important word to note here is calculate. If a DBMS does not allow any calculations to be done with the data on file, it is really only a file manager. The usefulness of file managers can still be very high in organizing information, however this limits its value for farm applications, as will be discussed below.

b. How They Work

To understand how a DBMS works it is important to know a few key words and how they apply.

Each complete name and address, (in the example above) is referred to as a record. The sub-records, i.e. first name, town, etc.., is a field or data field. As fields of data are entered and each complete record is stored, a file is formed. Any one file is made up of many records containing the same fields of data.

Try to think of records you may have stored in a drawer somewhere which would fit into this type of framework. Some obvious examples could be individual field crop records or livestock production records. If you do not have anything like these on file, have you not bothered because organizing them manually would be a big job?

Depending on the particular program, setting up the application will usually involve at least the following basic steps in one way or another.

1. Name the data fields - this field name will act as a prompt when entering data later.

2. Designate the width of the data field - the program needs to know how many characters of information that it must allow to be entered for each field.

3. Designate whether the data field will be Alpha/Numeric or Numeric only - if the program allows calculations, only calculations of numeric fields can logically be done. (Similar to spreadsheets) Some programs may also require more specific information on the type of data, like whether a date format is to be assumed.

4. Designate the place on the screen for that data field to appear. A proper screen layout will make data entry easier.

5. Designate calculated fields - similar again to spreadsheets, a formula can be assigned so that a value based on data in other fields will be calculated and reported.

6. Designate the fields of data to be printed and the location on a report - The width of the paper may determine how many data fields can be printed on one report.

The main advantage of a DBMS over spreadsheets (even those with a data base component) is the way in which information can be reported. The sorting function discussed in the section on spreadsheets, is the first main purpose of a DBMS.

Being able to select the records and possibly only certain fields of data from those records is the next critical function that should be compared among DBM programs.

Looking back to the example used for sorting in the spreadsheet section, namely beef pedigree records, sorting by birth date was requested. This would sort the possibly hundreds of records on file. However, only the calves from a certain bull may be useful. A true DBMS will allow the user to define a report which will only contain that particular information. More capable DBM programs will allow several selection criteria at once. Such as only the calves born since 1984, from a certain bull, with weaning weights between 400 and 500 pounds, sorted by descending weaning weights.

In very simple terms these are the primary functions of a data base management system. More complex functions to assist in integrating various files and data in what are referred to as Hierarchical and Relational DBMS, are also available and have much potential in farm applications. However, the knowledge level required to set up and operate a comprehensive database template can be very high. Many DBMS have been used more by programmers to reduce programming time than by end users. The cost of a good DBMS can also be quite prohibitive, particularly when compared to the cost of an application software package. There may be many practical uses for the simpler file managers if you are willing to spend the necessary time learning how they work. For example, if you are involved in any organization which has membership lists requiring more information than just name and address, a file manager should be of benefit. Simple cropping or livestock records may also be useful and would be a good start to more comprehensive record keeping later.

c. Features to Consider

As with spreadsheets, there are a large number of specific features available on the DBMS programs. Many are of a nature that very few applications require and would not be used until a high level of expertise was obtained. The few that are listed below are mentioned to give you a better idea of the types of functions a DBMS can perform and what initial questions should be asked when shopping for one.

A more complete list of characteristics to ask about can be found in Appendix B.

Functional Features

1. Files
- Can you name the file? How long can the name be?
- How many records are allowed per file?
- What other limitations on size of file?

Even though you may not wish to put a lot of information into each record, the total amount of information can add up quickly. For example, for a 100 cow beef herd, if records are desired for all the bulls and cows progeny, the number of records could easily span over 5 years production. That would mean over 500 records capacity is actually required for the 100 cow herd file.

2. Records
- Maximum size of records? By number of fields or bytes?
- Expandability - can fields be added or changed later?

At first you may only wish to keep a few data items on each record. Later you may want to add new data items (fields) to each record. If you would have to reenter all the old data into a newly designed file this change would be very time consuming and difficult.

3. Fields
- Names - how long can a field name be?
- Type of field - what is allowed? (text, numbers)
- Calculated fields - are they allowed and what type of calculations are allowed? Can several fields be used in one calculation?
- Formatting - how flexible? Are date formats allowed and later able to be used in calculations?
- Size - How large can any one field be?

4. Reports

- Sorting - can it be done on any field? Ascending or Descending? Easy to change?
- Search capability - Can searches be done by any field? How many criteria can be set for any one report? Can all logical functions be used? i.e. 〈 , 〉 ,=
- Formatting - Are reports easy to format, i.e. can you easily select which fields are to appear on a report and how they are displayed on screen or printed report?
- Names - Can report sort, select and format criteria be stored as a report name for future reference?
- Graphics - Are graphics capabilities built into the program or is a module available to display records or reports in graphic forms? Hardware requirements?
- Calculations - Can data in selected records on reports be used in summary type calculations? e.g. averages, totals

Cosmetic features

All the greatest functional advantages in the world will be useless to the operator if the program is difficult to operate or to learn how to operate. Date base management systems are much more varied in complexity and generally take more effort to master their operation than the other types of general use software. As with any program, the manual should be looked at first to see what level of experience is expected. If the manual is very difficult to understand, find out the type and amount of support available, i.e. is there someone experienced close by and willing to help? Find out how much time is usually required to learn how to operate the system.

Only after you determined that the program and support available has the potential of meeting your requirements, should you bother sitting down with it to see HOW it does what it is suppose to. The following are some of factors to take into consideration.

1. Prompting - are the menus or command prompt easy to understand? If the questions asked are not clear, errors in operation or data entry will occur, wasting time and possibly causing inaccurate reports.

2. Defining data fields - how easy is it to define the various field and record characteristics making use of the functional features of the program?

3. Data entry - error trapping - can entries be tested to meet preset field formats? e.g.. alpha vs. numeric, length, numeric limits, dates. Are the error messages clear?

- Prompts - Do they explain type of data to be entered? Can they be modified?
- Editing - Are changes to entered fields easy to make?

4. Report generation - How easy is it to design and generate a report? How long does it take to sort and select the desired information? Is the information available on screen and/or on printer?

d. An Example Application

A common farm data base that can benefit from a computerized DBMS is livestock pedigree records. Any kind of production of farm products has a large number of data items which are factors in production, costs and income. The example in figure 4 is only for a typical weaning record for beef animals. It contains 17 data items. A complete pedigree record with growth characteristics could easily total 30-40 data items which makes manual analysis almost unthinkable.

Figure 4 shows the format of the data items as they would appear on the screen to be able to input, update or just view any one record. This could be the design on any one of several DBMS programs. Each program however, uses different terminology and field characteristics to have the system work effectively. Figure 5 shows the types of field characteristics for the record formats in Figure 4 for the DBMS called Dataease. This is the program being used by Saskatchewan Agriculture Extension Branch. It shows the name of each field, the type and length, and seven more factors which have various effects on how the data can be used or manipulated to produce the desired results. Particularly the derived fields are calculated fields with the calculation also shown. The options are too numerous to mention here and would require training on this particular DBMS program to learn how to use them.

Figure 4
Example DBMS Template: Weaning Period

Weaning Record Form

Name _____

Address _____

Calf ID.	Sex	Cow ID.	Cow No.	Breed	Cow Age Yrs.	Sire Breed	Birth Wt. Lb.	Birth Date	Wean Date	Age Days

Wean Wt. Lb.	Ave. Daily Gain Lb.	Adj. Factor	Adj. 200 Day Wt.

Figure 5
Detail of DBMS Template File

Field Descriptions

No.	Name	Type	Long	Reqd	Index	Unique	Derived	Range Chk	Record size	Record offset
1	Name	Text	30	No	No	No	No	No	30	5
2	Address	Text	30	Yes	No	No	No	No	30	35
3	Calf ID.	Text	4	Yes	No	No	No	No	4	65
4	Sex	Text	1	Yes	No	No	No	No	1	69
5	Cow ID.	Text	4	No	No	No	No	No	4	70
6	Cow No.	Text	4	No	No	No	No	No	4	74
7	Cow breed	Text	4	No	No	No	No	No	4	78
8	Cow age	Number	2	No	No	No	No	No	1	82
	Number Type : Integer									
9	Sire breed	Text	4	No	No	No	No	No	4	83
10	Birth weight	Number	3	Yes	No	No	No	No	2	87
	Number Type : Integer									
11	Birth Date	Date	8	Yes	No	No	No	No	6	89
12	Wean Date	Date	8	Yes	No	No	No	No	6	95
13	Age	Number	3	Yes	No	No	Yes	No	2	101
	Number Type : Integer									
	Field calculation formula : Wean Date - Birth Date									
14	Wean Wt.	Number	3	Yes	No	No	No	No	2	103
	Number Type : Integer									
15	Ave. Daily Gain	Number	4	No	No	No	Yes	No	4	105
	Number Type : Fixed point									
	Digits to left of decimal = 1									
	Field calculation formula : (Wean Wt. - Birth Wt.) / Age									
16	Adj. Factor	Number	2	No	No	No	No	No	1	109
	Number Type : Integer									
17	Adj. 200 Day Wt.	Number	3	Yes	No	No	Yes	No	2	110
	Number Type : Integer									
	Field calculation formula : (Ave. Daily Gain *200) + Birth Wt. + Adj. Factor									

Figure 6 shows one report which can be generated from the information stored in the weaning record file. The weaning report shown has been set up to only print 9 of the 17 data items. This report has also been set up to only select and report on female calves born in 1985. The list of records found to meet this criteria has been sorted by descending Average Daily Gain. The mean calculation has also been done for five of the fields reported to provide more information on this particular group of animals.

Figure 6
Sample DBMS Report: Calf Weaning Records

Weaning Report-Female Calves 1985

Calf ID.	Cow ID.	Sire Breed	Birth Wt.	Birth Date	Age	Wean Wt.	Ave. Daily Gain	Adj. 200 Day Wt.
7057	33	CHCH	85	04/07/85	277	773	2.48	581
T018	M14	CHCH	90	03/27/85	288	803	2.48	593
T027	L2	CHCH	75	03/30/85	285	751	2.37	549
T062	I7	CHCH	90	04/08/85	276	728	2.31	552
T031	M18	AAAA	75	03/31/85	284	731	2.31	536
T093	E47	CHCH	85	04/27/85	257	675	2.30	544
T085	D23	CHCH	85	04/16/85	268	696	2.28	540
T035	61	AAAA	75	04/01/85	283	719	2.28	530
T009	K77	CHCH	90	03/25/85	290	744	2.26	541
T036	F20	AAAA	75	04/01/85	283	708	2.24	522
T077	35	AAAA	75	03/24/85	291	720	2.22	518

e. Limitations of Data Base Management Systems

While many of the same advantages exist for a DBMS as for a spreadsheet, there are more serious limitations to their widespread use by farmer computer owners.

1. More expertise required - Generally, to be able to achieve a given goal in applying a DBMS to your situation, much more time will have to be spent learning how the program operates, as compared to a spreadsheet or application software. The more powerful DBMS programs are usually command driven rather than menu driven, which is one of the main features of application software. The type of commands required to set up a comprehensive template on the larger DBMS, like DBase III, more closely resemble a programming language than general use software.

2. Few experts available - Since no one DBMS is as highly used as any one of the top 4 spreadsheet programs, it is more difficult to get expert assistance to help learn how to use the program. If this assistance is available, it is still less likely that any knowledge of farm application possibilities will be evident.

3. Few agricultural templates available - Since no one DBMS has really stood out in the market as one most farmer and other average computer owners would be able to operate, very few templates are available for public or private distribution. The private software developers have developed applied DBMS, like accounting or herd records programs from scratch rather than using any of the general use DBMS programs available. This has been done for two reasons.

Firstly, finding and learning how to operate a DBMS which will have the application capabilities for specific requirements of developers is still difficult. An individual may find a particular DBMS adequate, but commercial software has to appeal to more than just a few individuals.

Secondly, there are still significant development costs in applying a DBMS to a comprehensive application which would add to the cost for the end user who must then buy both the DBMS program and the

template and still have to spend more time learning how it operates than is usually necessary with an applied program. The end cost would likely keep most buyers out of that market.

f. Conclusion

There is no doubt that you will want to use your computer as a DataBase Manager. How you accomplish this will be your decision. By purchasing a dedicated (applied) database manager like accounting, crop record-keeping or herd record-keeping program, you may pay more in dollars but have an easier to use program which does most of the things you wanted it to do. By purchasing a general use DBMS, you will get a lot more flexibility, but be prepared to put a lot more time into it before anything useful comes out.

Most farmers have much more available raw data than they realize. Much of this raw data has not been recorded manually because of the large amount of work it would take manually to analyze it to assist in decision making. As more and more production factors are realized to be important to profitability, detailed financial and production records will also become more important and more difficult to analyze manually. Whatever decision is made to assist in solving these problems with a computer system, it should include room for additional factors to be recorded as you require them.

iii. Word Processors

a. What are They?

Most of the programs used in business including the general use ones discussed previously in this bulletin are primarily designed to process data. Accounting, spreadsheet and DBMS programs have all been designed to make the number crunching jobs easier and more accurate. They primarily replace the calculator. Word processing programs are designed to make the process of typing letters, documents and publications easier.

Word processors have replaced typewriters in many offices because of the much improved results and volume of documents that can produced. It does not make typing any easier, but if mistakes are made or changes are required, only the changes have to be made instead of re-typing the whole document. A typed document appears on the screen for review or editing before anything is printed. The document can then be printed or saved on diskette for future printing or revision.

There are few functional differences among the different word processing programs. Some do allow merging with mailing list files or spreadsheet templates and some will do simple calculations with numbers in a document. However, the many other features that vary from program to program are mainly cosmetic.

Some of the features that you should have demonstrated, as each program will do it a little differently, are the following:

Creating a Document - the most basic function - how is it done?

Editing - changing, inserting, deleting or moving - characters, words, lines, paragraphs.

Continuous Typing - does the computer know when a line is full and not break up words. Also, does it automatically hyphenate.

Spacing - can the width and length of printing on the paper be changed? Double or triple space? Left and Right justify?

Screen Viewing - can you see on the screen exactly the format of what will go to the printer?

Paging - are pages created automatically? How are page numbers included? Can they be on the top or the bottom of the page.

Headers and Footers - are they allowed and if so how are they placed?

The above are a few of the main functions. Other features like a dictionary, global search and replace, merging of different files, sorting and mathematical capabilities, to name a few, may also become more important. However, starting with a simple inexpensive program will likely be the best idea until you see more of the things you may wish to accomplish with it.

The cost of the various programs available will vary a great deal and will usually be in line with the relative value of its features.

b. Uses on the Farm

It is generally accepted that most farmers do not type. Application software to use on the farm is usually developed with this thought in mind so everything possible is done to reduce the amount of typing. However, the reason many people do not bother doing any typing is because of the fear of making mistakes which appear on the paper.

A word processor still requires the typing to be done, however, the results will be much better then from a typewriter. No one has to see the mistakes. The document can be viewed on the screen first and corrected before printing.

The actual uses on farms are likely even more variable then the other two general use types of software detailed in this bulletin. Like the other two types, the uses of a word processor is really up to the user's imagination and the more used, likely the more uses will be found. To start the process, here are a few ideas.

- If you sell seed or livestock - personalized letters to past customers with up to date supplies and prices would be a snap.

- Attach a typed note to the financial statements and projections being sent to the banker.

- As a secretary of a farm or community organization, typed minutes would be so much nicer.

- That letter to Revenue Canada, your local MP or MLA, or other government department requesting certain information would be much clearer to the reader if typed.

- Household uses for everything from that Christmas letter to friends to your children preparing school assignments.

These are just some ideas. Several computer companies now include a simple word processor along with a simple spreadsheet and mailing list program with the purchase of the hardware. Experiment with it and try to think of things you have not written in the past because it was going to be too much trouble getting it right.

C. Summary

This bulletin has been written for people who have already had some contact with microcomputers and have heard various opinions about how they can use general use software to meet their needs. General use software is being used by more and more people to meet specific needs. As a result, programmers are designing better, easier to use general use software. However, there is still little doubt that to make good use of spreadsheets, data base management systems and word processors more educational effort than for most application software packages is required.

The motivation to go to the extra effort may come in several ways. It may simply be a new level of interest to see what the machine can do based on the usefulness of other programs. It may be the need for information that can not be obtained from application software. Whatever it is that motivates you to use the computer more, likely the better off you will be.

You may have thought that a computer system will allow you to spend a lot less time on the tedious office type work. In one way this is true. However, most farmers have found that they are spending more time in the office, using the computer, than they ever did before. Whatever type of program they use most, it is providing information not available before for decision-making. This is allowing them to farm smarter instead of harder.

There is no magic answer as to the best software farmers should use. As in any major business decision it is important to find out what the options are. The general use software discussed in this bulletin is to one of the options and should be considered along with information on the others.

There is no doubt that general use software has a great deal of potential on farms but it is not for all farmers. Take a close look at all the options and commit time to learn how each option can benefit your farm business.

Appendix A

Spreadsheet Features and Characteristics to Compare

System Requirements

1. Hardware models
2. DOS version
3. Memory size
4. Diskettes and number of drives

Format Capabilities

1. Number of columns and rows
2. Variable column width - by sheet or by individual column
3. Insert/delete rows or columns
4. Windows - with borders, colors
5. Lock titles
6. Align cell contents - left, right, center
7. Use cursor to build formulas
8. Lock cells
9. Restrict cell contents to numeric only or text only
10. Display numbers - with commas
    - without trailing 0's
    - with specified decimals
    - with $ sign
    - with % sign
    - as integer
    - in scientific notation
11. Copy - formulas, text, numbers
12. Display text wider than present column width
13. Move column/row
14. Sort column

Functions (formulas allowed)

1. Basic mathematical functions (+,-,*,/)
2. SUM
3. AVERAGE - complete list or just non-zero cells
4. COUNT - complete list or just non-zero cells
5. Minimum or maximum value search
6. IF THEN ELSE
7. Days between dates

Output

1. To printer - by file name
    - by columns and rows specified
    - automatic page width structuring
    - page numbering
    - omit blank rows or columns
    - print out formulas

2. To diskette - warning before overwriting
   - warning to save changes
3. To integrating files
4. To graphics program
5. To data base program
6. To word processing program

Other
1. Load files on diskette using cursor
2. Help screens within operation
3. Name cells
4. Command line detail
5. Escape
6. Speed of operation and recalculations
7. Conversion of templates written for other spreadsheets
8. Automatic or manual recalculations
9. All calculations on each recalculation

Documentation
1. Quick reference guide
2. Detailed index
3. Tutorial (examples)
4. Technical manual
5. Easy to understand

Support
1. Dealer knowledge
2. Learner's guide or short course available
3. Warranty
4. Product updates

Appendix B

DBMS Characteristics to Compare

System Requirements
1. Hardware models
2. DOS version and language
3. Memory size
4. Number of diskettes and drives
5. Printer capability

Data Fields
1. Names and types available
2. Default values
3. Formatting
4. Size limits
5. Maximum per record
6. Types of calculations available (days between dates)

Records
1. Easy to identify
2. Expandability and modification capability
3. Number of key records allowed

Files
1. Maximum number of records
2. Maximum size of file
3. Expandability
4. Ease of adding or deleting records
5. File definition
6. Ability to link files

Data Entry
1. Type and size testing
2. Prompts supplied or allowed
3. Help screens
4. Editing of input
5. Entry display options

Reports
1. Search capability
2. Sort capability
3. Report formatting flexibility
4. Storage of reports and formats
5. Graphic capability
6. Speed of report generation

General
1. Programming knowledge required
2. Simplicity of operation
3. Manual quality - understandable, thoroughness, examples
4. Support - dealer knowledge, user groups, warranty
5. Backups - program, template, files